

# VZ-200 TERMINAL

With the addition of a low cost V.21 modem this project will get your Dick Smith VZ-200 talking to the world! Designed and developed by the DSE Research and Development team at North Ryde, the ETI-695 must be the cheapest way to get a 300 baud glass terminal going yet.

THE VZ-200 was very good 'value for money' when it was released by Dick Smith Electronics a few years ago. The last batch sold was heavily discounted and no doubt many were snapped up by ETI readers, especially RTTY enthusiasts after the ETI-756 RTTY adaptor appeared in Nov/Dec '84. This project extends the VZ's capability to operate as a 300 baud serial terminal. Although the VZ-200 is no longer available the unit will also work with the latest VZ-300 computer which has an improved keyboard.

## Construction

The pc board is designed to fit into a VZ expansion case which adds a professional finish to the project and is recommended. The case needs a bit of surgery to mount the DB-25S connector, so mark out the cut at the back of the 'top' half of the box (the

larger piece). The connector sits flush with the lip of the half-case. Drill the two mounting holes for the DB-25S and screw it in with the 12 mm x 4BA screws and nuts.

Check over the pc board before commencing construction, look for broken tracks, bridges and undrilled holes. The prototype pc board has been tinned and had a couple of holes covered by the solder. These are best handled by heating the spot with a soldering iron and a bit of solder wick, if you try and force the component leads through such blocked holes you run the risk of lifting the copper away from the board and breaking bits off.

Start off by soldering in the ten wire links. One of them is near a mounting hole and should be bent around the hole to leave it uncovered, the other nine links should be straight and tight.

The 44-way edge connector can go in

next. It mounts from the component side of the board (of course). The solder tails should be pushed through the board so that the bottom of the plastic part of the connector is flush with the copper side of the pc board. This is necessary to fit the finished pc board correctly into the case, so make sure the connector is aligned before soldering.

Some of the resistors mount on their ends. Be careful not to bend the leads too close to the resistor body to avoid breaking the leads off.

Solder in the capacitors before the diodes, since the two electrolytic caps are a wee bit close to diodes D4 and D5, which mount on their ends.

The two smaller transistors Q1 and Q2 can go in next, followed by Q3 which should be bent over if it is a BD139, as in the photograph. Solder the IC socket and the four ICs being careful to avoid solder bridges between the pins.

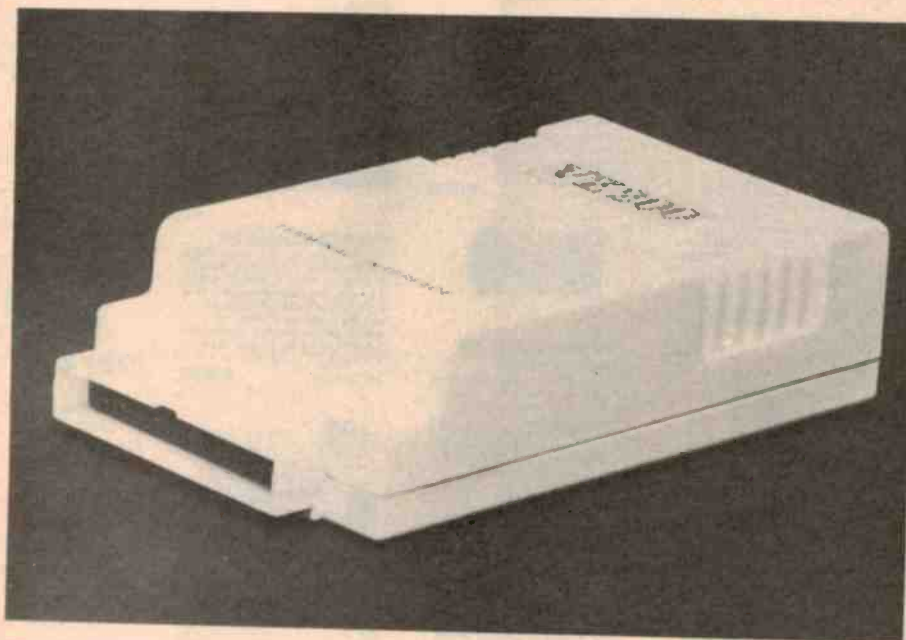
The three wires to the DB-25S connector were brought to the copper side of the pc board on the prototype; you may wire from the component side if you prefer before soldering.

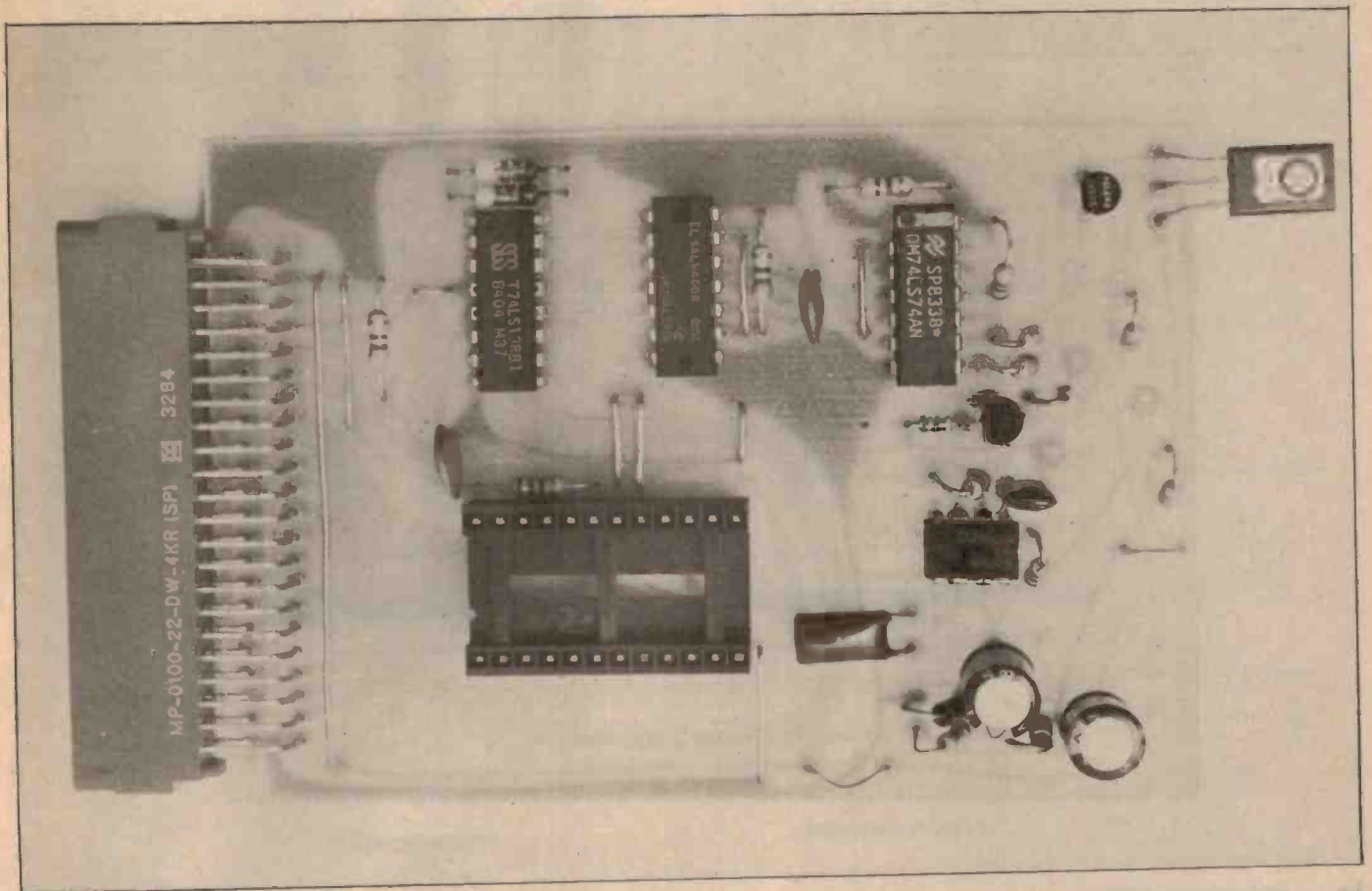
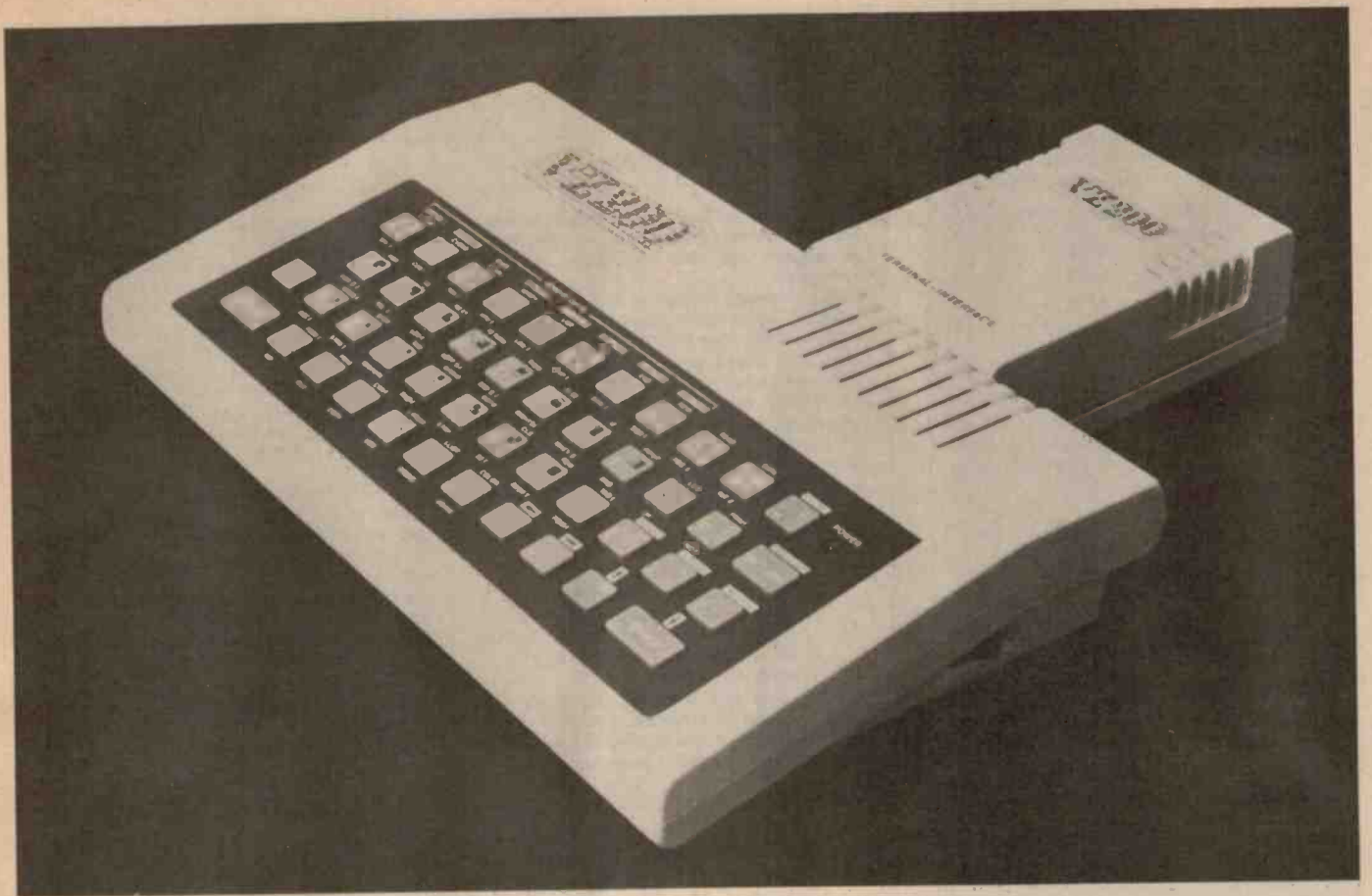
Place the bottom half of the case down and push the 44-way connector through the slot in the end with the copper side of the pc board uppermost. Align the two pc board holes with the mounting pillars and fit the top half of the case. Finish off by putting the case screws in and the project is ready to test.

## Testing

Make sure your VZ-200 is operating properly before connecting the project. The interface plugs into the memory expansion port which is the largest on the back of the computer. Power should be switched off while inserting or removing the unit.

Testing is best done with a 300 baud terminal (or another computer emulating one) otherwise you will have to call a friend or bulletin board with a modem. To actually ►







## PARTS LIST — ETI-695

NOTE — A complete kit of parts can be obtained from your Dick Smith store.

Resistors.....all 1/4 W, 5%

R1, 2, 3, 4, 10 .....4k7  
R5, 12 .....1k  
R6 .....33k  
R7, 11 .....10k  
R8, 9 .....3k3  
R13 .....2k7

### Capacitors

C1, 2 .....100n ceramic  
C3, 4 .....10n polyester (greencap)  
C5, 6 .....100μ 16 V RB electrolytic

### Semiconductors

IC1 .....74LS138  
IC2 .....2516 "VZRS" EPROM  
V1.5 or later  
IC3 .....74LS74  
IC4 .....74LS33  
IC5 .....555 timer  
Q1 .....BC548  
Q2 .....BC557  
Q3 .....BD139 or BC639  
D1, 2 .....1N60 Ge diodes  
D3 .....1N914  
D4, 5 .....1N4002

### Miscellaneous

Printed circuit board "VZRS232"; VZ expansion case; 44-way female edge connector right angle pcb mounting; DB25S chassis socket; 2 x 12 mm 4BA screws and nuts; 24 pin DIP IC socket; tinned copper wire, hookup wire, solder, etc.

Price estimate: \$49.95

## SOFTWARE OPERATION

The VZ terminal interface is totally software based. This text is to serve as a functional description of the operation of this software.

The software resides in an EPROM on the interface board and maintains a data area in RAM at 8000 hex. In this data area are the flags and values used by the terminal software. At power-up these values are set to pre-defined values of 8 data bits, 1 stop bit and no parity. The unit is 300 baud only.

After the power-up sequence has been completed, the software goes into a loop waiting for keyboard input from the user. At this time the user can select one of seven menu options, these are:

- 0) go to the terminal;
- 1) select full/half duplex;
- 2) toggle printer output on/off;
- 3) set number of data bits (7 or 8);
- 4) set number of stop bits (1 or 2);
- 5) set parity (odd, even or none);
- 6) set lf to cr option

If the user has selected one of the options 1-6, the appropriate action is taken and displayed on the screen. If option 0 is selected the software goes into terminal mode.

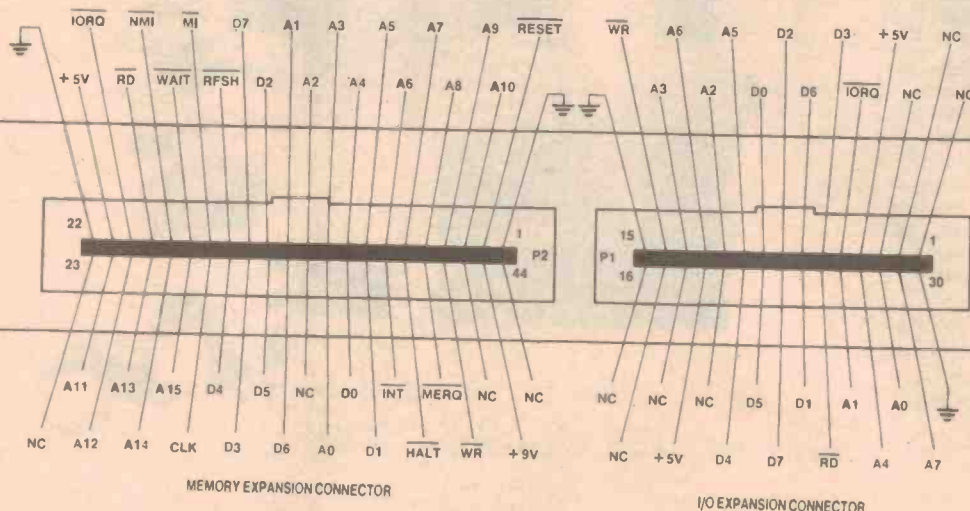
If the user selected option 0, the system begins looking for either keyboard input or incoming serial data. If a key has been pressed on the keyboard, then the software gets the value of that key, determines if it is a 'return to main menu' key (shift-x); if this is so it returns to the main menu, otherwise it sends the character to a routine that decodes it into bits and sends it serially to the interface hardware. It also adds start, stop and, optionally, parity bits. If the duplex option is set to half, it will echo to the screen as well.

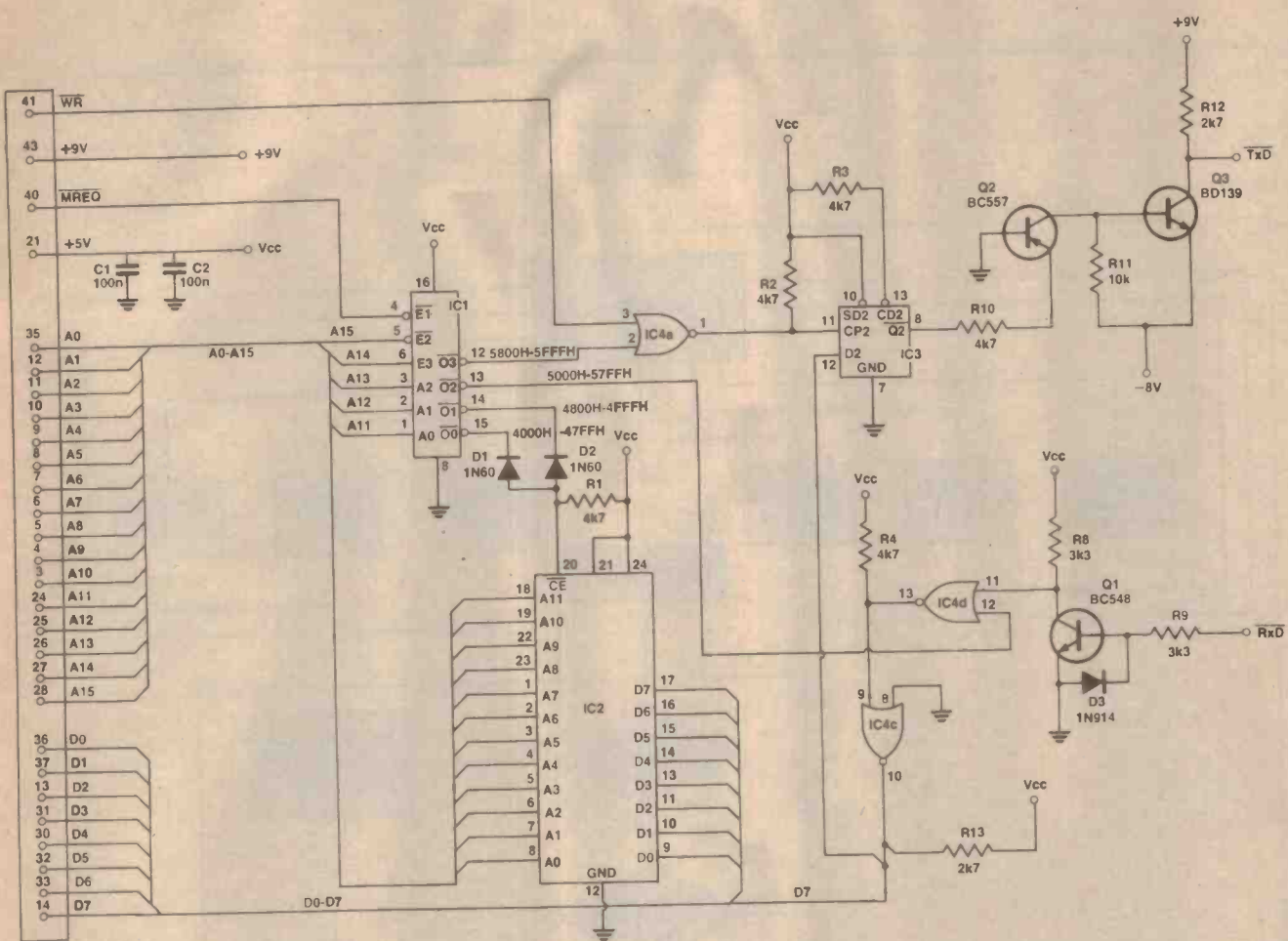
If incoming serial data is found (by detecting a transition from a stop to a start bit), the software goes into a loop, reading bit seven of a port and encoding the incoming serial data bits into a byte, taking due consideration to the state of the start bit, stop bit(s) and optionally the parity bit. After a valid character is assembled it is sent to the screen and optionally to the printer.

The terminal operation continues until it detects a shift-x key, at which time it returns to the main menu.

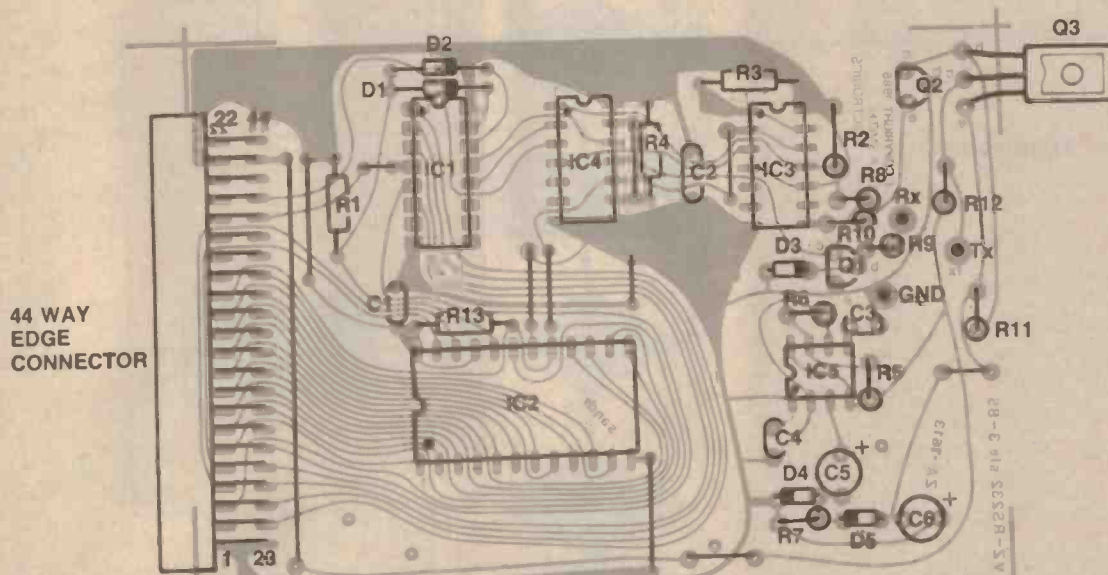
VZ-200 REAR PANEL LAYOUT

CHARGE PUMP CIRCUIT



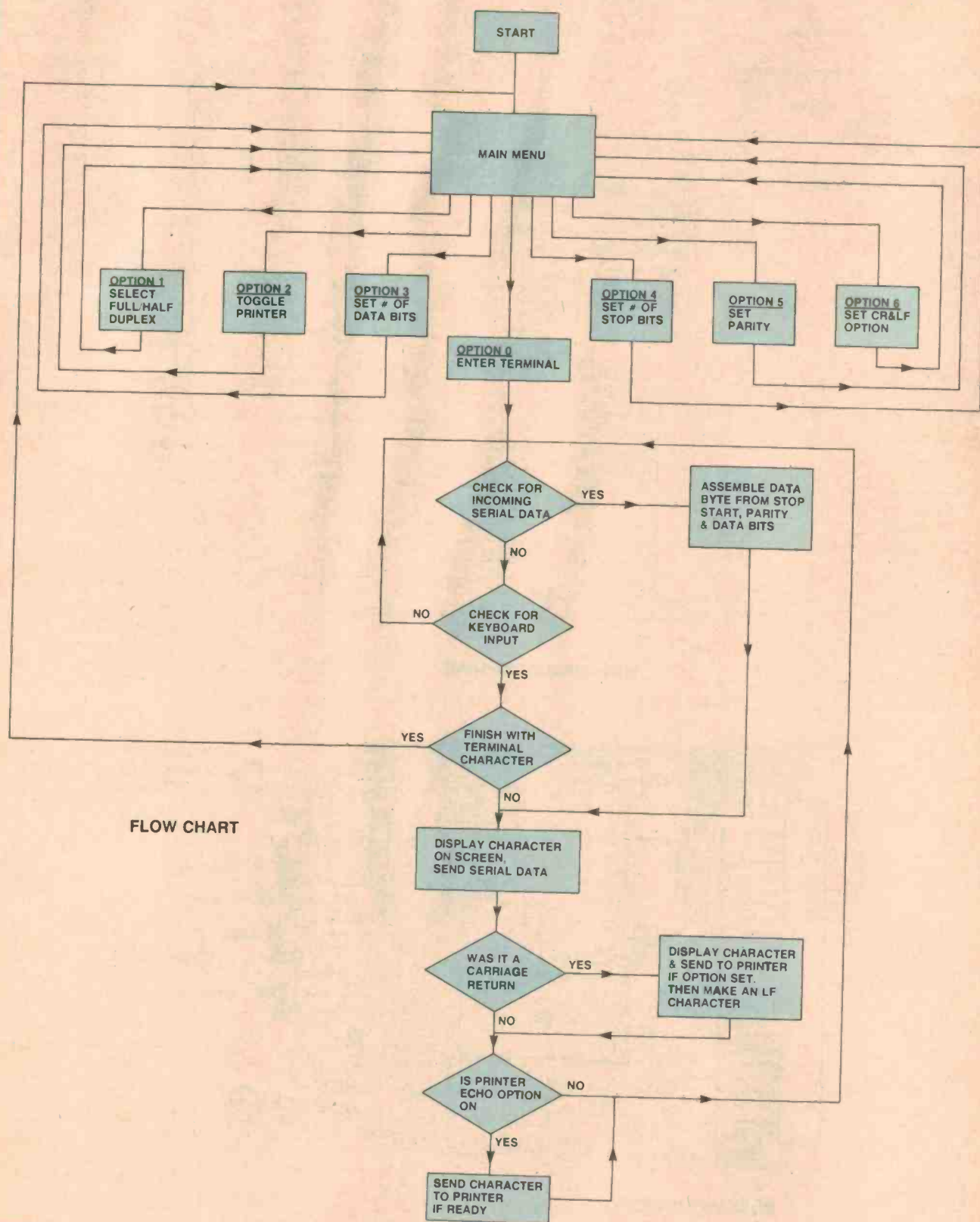


MAIN CIRCUIT DIAGRAM



COMPONENT OVERLAY





## HOW IT WORKS — ETI-695

The terminal interface provides a Dick Smith VZ-200 or VZ-300 computer with the hardware and software necessary to emulate a simple 300 bit/s terminal. The software supports full or half duplex operation and has a printer echo option to record the conversation.

### THE VZ-200 COMPUTER

The basic VZ-200 computer employs a Z80 microprocessor running at a clock speed of 3.58 MHz. Two 8K x 8 mask-programmed ROMs contain the Microsoft BASIC Interpreter, while three 2K x 8 static RAMs provide program memory.

A 6847P-1 video controller chip and a further 2K x 8-bit static RAM form the heart of the computer's video section.

A simple software scanning scheme is used for the keyboard. The keys are arranged in eight rows, each of which can be pulled down to low logic level by diodes connected to the eight least significant address lines (A0-A7). The other sides of the keys are connected to six column lines, which are connected to six of the inputs of a gated octal buffer, and also to six pull-up resistors. The octal buffer's outputs are connected to the six least significant data lines of the processor (D0-D5).

Simplified decoding is used for selection of the various I/O devices in memory space. The memory address ranges occupied are as follows (in hexadecimal notation):

### VZ-200 MEMORY MAP (WITH TERMINAL)

0000-1FFF basic ROM 0  
2000-3FFF basic ROM 1  
4000-47FF terminal EPROM  
4800-4FFF spare space, can be used with 2532 EPROM  
5000-57FF receive data, data on data bit 7  
5800-5FFF transmit data latch, data sent on data bit 7  
6000-67FF not used in terminal  
6800-6FFF keyboard, cassette interface, speaker, VDC  
7000-77FF video RAM  
7800-8FFF inbuilt user RAM  
9000-FFFF reserved for memory expansion modules

Note that due to the simplified addressing, the output latch serving the cassette output, speaker and video display controller effectively occupies all addresses from 6800-6FFF inclusive. Similarly the keyboard/cassette input buffer also occupies all of this address

range, although the individual rows of keys effectively occupy discrete addresses.

For more information on the VZ-200 consult the VZ-200 Technical Reference Manual available from Dick Smith Electronics.

### THE TERMINAL HARDWARE

The project connects to the VZ-200 through the memory expansion connector (P2) and its memory mapped.

IC1 decodes the Z-80's address lines to provide select signals for the EPROM IC2, the transmit latch IC3 and the receive data gates.

The incoming RS232 signal is converted from a -12/+12 volt signal to a TTL compatible signal by T1, thence to IC4 where it is gated with the 5000-57FF enable signal. If this enable signal is true (active low) the received data is inverted and fed to data bit D7 where it is read by the terminal software.

The outgoing TTL signal is sent from data bit D7 to IC3 where it is latched. The clock for IC3 is provided by gating the processor write enable with the 5800-5FFF output from IC1. The output from IC3 is level shifted by T2 and T3 to obtain an RS232 compatible signal. The negative voltage used by T3 is generated in a charge pump circuit based on IC5, a '555 timer.

## SOURCE CODE

A complete documented source code listing of the software will be available on the Dick Smith Bulletin Board in the near future (according to Steven Engels of Dick Smith Electronics). The listing is too long to reproduce in the magazine. THE DSE-BBS is reached on: (02)887-2276 within Australia; +61 2 887-2276 on ISD.

The DSE-BBS is online 24 hours except on Fridays between 3 pm and 5.30 pm Eastern Standard Time.

### TECHNICAL INQUIRIES

As the complete project including software was developed at DSE, all inquiries about the VZ-200 terminal project should be directed to Dick Smith Electronics.

communicate you have to enter the terminal mode from the menu by typing 0.

Providing the character length, parity and stop bits are identical you should have no trouble using the ETI-695 as a simple terminal.

We had some problems using the printer echo command with an Admate DP-80 printer using version 1.5 of the VZRS EPROM. This may be fixed in later versions, after our publication deadline. ●

## HEXADECIMAL MACHINE CODE LISTING VZ-RS V1.5

ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0100:	AA	55	E7	18	C3	84	41	4F	4E	20	4F	46	46	46	55	4C
0110:	4C	48	41	4C	46	0C	56	5A	2D	32	30	30	2F	33	30	30
0120:	20	52	53	2D	32	33	32	20	2D	20	56	45	52	53	49	4F
0130:	4E	20	31	2E	35	0D	28	43	29	20	31	39	38	35	20	44
0140:	49	43	4B	20	53	4D	49	54	48	20	45	4C	45	43	54	52
0150:	4F	4E	49	43	53	0D	2D	2D	2D	2D	2D	2D	2D	2D	2D	2D
0160:	2D	2D	2D	2D	2D	2D	2D	2D	2D	2D	2D	2D	2D	2D	2D	2D
0170:	2D	2D	2D	2D	2D	0D	30	5D	20	45	4E	54	45	52	20	54
0180:	45	52	4D	49	4E	41	4C	0D	31	5D	20	46	55	4C	4C	2F
0190:	48	41	4C	46	20	44	55	50	4C	45	58	3A	00	46	55	4C
01A0:	4C	0D	32	5D	20	54	4F	47	47	4C	45	20	50	52	49	4E
01B0:	54	45	52	20	20	3A	4F	46	46	0D	33	5D	20	53	45	54
01C0:	20	23	20	44	41	54	41	20	42	49	54	53	20	3A	38	20
01D0:	20	0D	34	5D	20	53	45	54	20	23	20	53	54	4F	50	20
01E0:	42	49	54	53	20	3A	31	20	20	0D	35	5D	20	53	45	54
01F0:	20	50	41	52	49	54	59	20	20	20	20	20	20	3A	4E	20

ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0200:	20	0D	36	5D	20	41	44	44	20	4C	46	20	54	4F	20	43
0210:	52	20	20	20	20	3A	4F	46	46	0D	0D	2A	2A	2A	2A	2A
0220:	2A	2A	20	57	48	45	4E	20	49	4E	20	54	45	52	4D	49
0230:	4E	41	4C	20	2A	2A	2A	2A	2A	2A	2A	2A	20	20	53	48
0240:	49	46	54	20	2D	20	58	20	54	4F	20	45	58	49	54	20
0250:	54	45	52	4D	49	4E	41	4C	20	20	2A	2A	2A	2A	2A	2A
0260:	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A
0270:	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A	2A	00	00	00	00
0280:	00	00	00	00	F3	31	00	90	21	9D	40	11	00	80	01	E7
0290:	00	ED	B0	3A	E1	80	F5	3E	01	32	E1	80	21	15	40	CD
02A0:	4D	43	21	00	80	CD	4D	43	F1	32	E1	80	CD	50	34	21
02B0:	93	41	E5	CD	66	44	B7	28	FA	D6	30	38	F6	FE	07	30
02C0:	F2	21	CE	41	87	5F	16	00	19	5E	23	56	EB	E9	56	42
02D0:	DC	41	F7	41	38	42	47	42	0B	42	01	42	3A	E0	80	B7
02E0:	3E	01	21	11	40	28	04	AF	21	0D	40	32	E0	80	11	00
02F0:	80	01	04	00	ED	B0	C9	21	DF	80	11	19	80	CD	21	42

continued ►



## MACHINE CODE LISTING CONTINUED

ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0400:	00	18	04	FE	4F	18	F4	32	00	58	CD	23	43	3A	49	80
0410:	D6	30	47	AF	32	00	58	CD	23	43	10	F7	C9	3A	00	50
0420:	CB	7F	C9	F5	C5	CD	2E	43	CD	2E	43	C1	F1	C9	C5	3E
0430:	23	06	0B	10	FE	3D	20	F9	C1	C9	CD	2E	43	C5	3E	22
0440:	18	EF	F5	C5	01	FF	4F	CD	60	00	C1	F1	C9	7E	B7	C8
0450:	CD	6E	43	23	18	F7	21	00	70	22	ES	80	11	01	70	01
0460:	FF	01	36	60	ED	B0	AF	32	E4	80	32	00	68	C9	F5	E5
0470:	C5	D5	CD	7A	43	D1	C1	E1	F1	C9	ED	5B	E5	80	FE	0C
0480:	28	D4	FE	0D	28	7E	FE	08	28	35	FE	09	28	16	FE	0A
0490:	28	4A	FE	07	CA	50	34	CB	7F	20	08	FE	20	F8	CD	5D
04A0:	44	CB	F7	12	13	ED	53	ES	80	3A	E4	80	3C	32	E4	80
04B0:	FE	20	F8	CD	F3	43	3A	DF	80	B7	C8	CD	49	44	C9	3A
04C0:	E4	80	B7	28	0A	3D	32	E4	80	1B	ED	53	E5	80	C9	E5
04D0:	21	00	70	B7	ED	52	E1	C8	3E	1F	18	EA	3A	E4	80	4F
04E0:	06	00	C5	CD	F3	43	C1	EB	09	EB	ED	53	E5	80	79	32
04F0:	E4	80	C9	3A	E1	80	F5	3E	01	32	E1	80	CD	04	44	F1

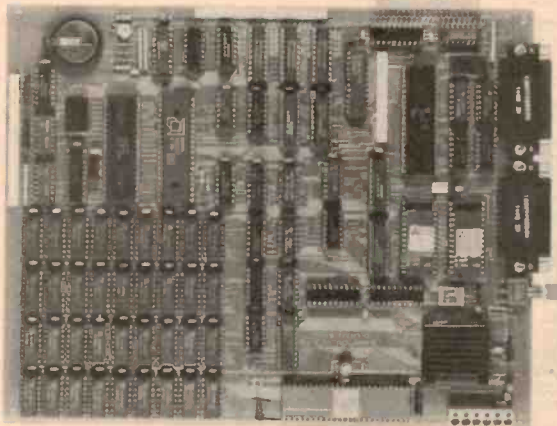
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0500:	32	E1	80	C9	E5	EB	3A	E4	80	5F	16	00	B7	ED	52	3A
0510:	E1	80	B7	28	04	11	20	00	19	EB	21	00	72	B7	ED	52
0520:	28	0A	ED	53	E5	80	AF	32	E4	80	E1	C9	21	20	70	11
0530:	00	70	01	E0	01	ED	80	21	E0	71	11	E1	71	01	1F	00
0540:	36	60	ED	B0	11	E0	71	18	D9	CD	C4	05	C8	47	C0	CD
0550:	E2	3A	C9	CD	C4	05	CB	47	C0	79	C3	8D	05	FE	61	D8
0560:	FE	7B	D0	E6	5F	C9	21	FE	68	0E	08	06	06	7E	F6	04
0570:	1F	30	58	10	FB	CB	05	0D	20	F1	06	04	21	DF	68	7E
0580:	CB	57	28	3D	CB	05	7E	CB	57	28	3A	CB	05	CB	57	28
0590:	38	CB	05	CB	05	7E	CB	57	28	11	CB	05	7E	CB	57	28
05A0:	11	3E	FF	32	E2	80	AF	32	E3	80	C9	3A	E3	80	CB	D7
05B0:	18	05	3A	E3	80	CB	CF	32	E3	80	3E	FF	32	E2	80	AF
05C0:	C9	0E	03	18	06	0E	02	18	02	0E	01	21	05	45	1E	00
05D0:	3A	E3	80	CB	57	28	04	1E	60	18	06	CB	4F	28	02	1E
05E0:	30	3E	08	91	4F	3E	06	90	47	CD	FA	44	83	06	00	4F
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ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
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0610:	46	42	58	20	43	5A	56	35	32	20	33	31	34	4E	2E	20
0620:	2C	20	4D	36	39	2D	38	30	37	59	4F	0D	49	50	55	48
0630:	4C	3A	4B	3B	4A	00	00	00	00	00	00	00	00	00	00	00
0640:	00	00	65	00	00	00	00	25	22	20	23	21	24	00	3E	00
0650:	3C	00	5C	26	29	3D	28	40	00	00	00	00	00	00	00	00
0660:	3F	2A	2F	2B	00	14	17	00	05	11	12	07	13	00	00	01
0670:	06	02	18	00	03	1A	16	00	00	00	00	00	00	0E	00	00
0680:	00	00	0D	00	00	00	00	00	00	19	0F	00	09	10	15	08
0690:	0C	00	0B	00	0A	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
06A0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
06B0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
06C0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
06D0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
06E0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
06F0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF

ADDR	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0700:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0710:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0720:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0730:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0740:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0750:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0760:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0770:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0780:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0790:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
07A0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
07B0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
07C0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
07D0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
07E0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
07F0:	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF

## **P** -186 80186 SINGLE BOARD COMPUTER



### Features

8MHz 80186-3 (10MHz optional)  
Up to 1Mbyte parity checked memory  
Two serial ports to 38400 baud  
Centronics printer interface  
Double density 8" or 5 1/4" floppy disc interface  
SASI hard disc interface  
Boot ROMs  
CMOS battery backed calendar clock  
TurboDOS operating system available

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TurboDOS **395.00**  
Manual **25.00**

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Phone the editor, David Kelly, on (02) 663-9999, Mon to Fri, 8.15 to 9.30 am.



## ETI-695: VZ-200 terminal

Was developed in association with Dick Smith Electronics and supply should, therefore, not be a problem unless you happen to live in the Kermadec Islands. Just place about fifty odd dollars in your sweaty little paw and trot down to the local store.

## ETI-341: Electronic jumper leads

Ian Thomas's method of restarting your old bomb after you went into the boozier and forgot the lights were on is called the Electronic Jumper Leads. Jaycar in Sydney and Altronics in Perth will be supplying a kit for this one.

## ETI-251: Op-amp power supply

All the parts for this are as common as mud. We got the transformer we used in the proj-

ect from Arista. Altronics in Perth will be selling it as a kit, and promising 24 hour turnaround on their mail order business.

Jaycar has asked us to inform those of you waiting with baited breath for the Capacitor Discharge Ignition kit by Ian Thomas (February 1985) that they are available once again after a drought caused by lack of components.

VSI is in the marketplace if you need Motorola parts, but advises that a \$5 minimum exists.

If you have trouble with any of these components try All Electronic Components in Melbourne, which will probably be doing all of this month's projects as kits.

## Artwork

For those constructors willing and able to

make their own pc boards and/or front panels, we can supply same-size film transparencies of the artwork, positives or negatives as you require. From the list given below, select what you want and address your request/order to:

'ETI-xxx Artwork'  
ETI Magazine  
Waterloo NSW 2017

When ordering, make sure you specify positives or negatives, according to the process you use. Your cheque or money order should be made payable to 'ETI Artwork Sales'. Prices for the artwork for this month's projects are as follows:

ETI-695 (pcb) .....	\$4.42
ETI-341 (front panel) .....	\$4.30
(pcb) .....	\$4.30
ETI-251 (front panel) .....	\$6.25
(pcb) .....	\$4.80

# MINI MART

WANTED: AWA HF LINE AMP, gain -6 to +6 dB, cable length to 1200'. Also, manual, circuit, etc for Yaesu FT200 A/O WS62 Mk III a/o Weston radio tel LM-230. (046)84-1061.

FOR SALE: MARCONI SIGNAL generator TF 801D/1 10 to 470 MHz, 0.1  $\mu$ V to 600 mV \$150. (02)406-5338.

FOR SALE: SCHOMANDL FDI frequency meter 30-920 MHz with manual or exchange HF ham gear. Alan Woolnough (VK4GO), PO Box 26, Lawnton, Qld 4501. (07)285-3346.

FOR SALE: AWA SS220 TRANSCEIVER, 6 ch, 2-15 MHz, 100 W AM/SSB with ac supply, mic, tuned whip, base, manual. VCG. \$300 or swap Comm Rec, Scope or WHY. (046)84-1061.

FOR SALE: SUPERGOLF simplified, entertaining, graphics throughout, continuous scores \$16.50, One-day International Cricket \$15, Test Cricket \$16.50. G. Gardoz, 1 Yarana Dr, Mt Helen, Vic 3350.

FOR SALE: DISK DRIVE MPI51 5 1/4 SSDD unused suit SYS80, TRS80, M'Bee, Acorn 34 pin connector. \$170. (042)96-6623.

FOR SALE: \$100 9-SLOT motherboard, 640 VDU, two Eprom boards \$150 ono. D2 kit \$80 ono. Encoded keyboard in case \$50. SYM-1 microcomputer memory expansion board, Eprom programmer, documentation \$350 ono. Michael (049)54-8135.

FOR SALE: DISK DRIVE M4854 1.6 meg \$260, also GP100 printer \$95. R. McKenzie, 35 Moore Ave, Croydon, Vic 3136. (03)723-3937.

FOR SALE: MICROBEE tape copier, backup at 300/1200, change auto start, remove double headers, etc \$9.80 incl postage. J. Arnold, 36 Victoria St, Rooty Hill, NSW 2766. (02)625-8950.

FOR SALE: LOTUS 1-2-3 Tutorial and operating system diskettes for IBM-PC with Spreadsheet, info management, graphs. \$340. A. Naser, 12 First St, Granville, NSW 2142. (02)682-6861.

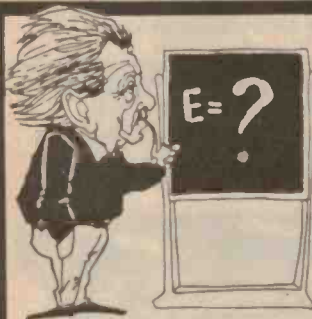
FOR SALE: TEKTRONIX 454 dual beam 150 MHz delay CRO and 603 storage monitor. M. Sheriff, 457 Sydney Rd, Balgowlah, NSW 2093. (02)949-2454 bh, 982-6525 ah.

FOR SALE: EPROMS 2708 50c, 2716 \$1.50, 2532 \$2.50. D2 microcomputer plus documentation \$100. \$100 9 slots with boards \$150. Mike, 9 Main Rd, Cardiff Hts, NSW 2285. (049)54-8135.

FOR SALE: SUPER 80 32K with sockets, BASIC ROM, \$100 expans, parallel/serial interface, power supply, manuals. \$300. D. Allen, PO Box 30, Cocos (Keeling) Is, Indian Ocean 6799.

FOR SALE: THE CHEAP Video Cookbook, Z80 tech and users manuals, CP/M assembly language programming, 2 x Z80A CTCs, PIO, I/O light pen — suit TRS80 etc M'Bee Edasm ROMS. \$95. Willi sep. (03)583-6497.

FOR SALE OR SWAP: 125 MINI reed switches \$5. Paul Shurvell, C/- Elliminyt PO, Vic 3249. (052) 33-8314 after 5 pm.



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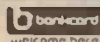
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